

Notice of Allowability

Application No.

09/729,833

Applicant(s)

PEI-REN JENG

Examiner

Art Unit

Hsien-Ming Lee

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 9/25/03.
2. ☒ The allowed claim(s) is/are 51-63.
3. ☒ The drawings filed on 06 December 2000 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
- * Certified copies not received: _____.
5. ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- (a) ☐ The translation of the foreign language provisional application has been received.
6. ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application. **THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

7. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
8. ☐ CORRECTED DRAWINGS must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No. _____
- (b) ☐ including changes required by the proposed drawing correction filed _____, which has been approved by the Examiner.
- (c) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No. _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet.

9. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- 1 ☐ Notice of References Cited (PTO-892)
- 3 ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 5 ☐ Information Disclosure Statements (PTO-1449), Paper No. _____
- 7 ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
- 2 ☐ Notice of Informal Patent Application (PTO-152)
- 4 ☒ Interview Summary (PTO-413), Paper No. 101503
- 6 ☒ Examiner's Amendment/Comment
- 8 ☒ Examiner's Statement of Reasons for Allowance
- 9 ☐ Other

DETAILED ACTION

Remarks

1. The double patenting rejection to claims 51-63 is withdrawn in response to applicant's submission of Terminal Disclaimer filed 9/25/03.

Examiner's Amendment

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Randy A. Noranbrock (Reg. No. 42,940) on Oct. 15, 2001.

3. The application has been amended as follows:

In claim 51, at line 7, replace " part of the thickness under the masking" with – part of *said dielectric layer* under a masking --; at line 16, replace " photoresist to etching " with – photoresist to *etch* --; and at line 17, replace "the etching rate" with – *an* etching rate --.

In claim 52, at line 1, replace "wherein the process of" with – wherein a *step* of --.

Allowable Subject Matter

4. Claims 51-63 are allowed.
5. The following is an examiner's statement of reasons for allowance:

The prior art of record, Chen et al. to US 6,080,663, teaches a method for forming a dual damascene opening, comprising:

- providing a substrate 200 with a dielectric layer 204 in a thickness thereon (Fig.2A);

- providing a first patterned photoresist layer 208 on said dielectric layer 204 to expose a first portion of said dielectric layer 204 (Fig.2B);
- implanting ions 210 into said first portion of said dielectric layer 204 in a depth h of part of the thickness under a masking of said first patterned photoresist 208 so as to form a *doped* region 212 in said first portion of said dielectric layer 204 (Fig.2B);
- removing said first patterned photoresist layer 208 (Fig.2C);
- providing a second patterned photoresist layer 218 on said dielectric layer 204, said second patterned photoresist 218 defining an etching opening 217a for exposing at least part of said *doped* region 212 (Fig. 2C) and a second portion of said dielectric layer 204 (Fig.2C);
- performing an etching process whose by said second patterned photoresist 218 to etch said dielectric layer 204 under said etching opening 217a until exposing said substrate 200 (Fig.2D), wherein an etching rate of said *doped* region 212 is *higher* than said second portion of said dielectric 204 (col. 4, lines 9-10),whereby a *trench* region 220a is formed in said *second portion* of said dielectric 204 and a *via* region 220b is formed in said *doped region* 212; and
- removing said second patterned photoresist layer 218 to form said dual damascene opening having said *trench* region 220a and said *via* region 220b (Fig. 2D).

In contrast, Chen et al. teach forming the *doped* region 212 which has a *higher* etching rate than said second portion of said dielectric 204, which is different from the instant invention (i.e. an etching rate of a dense region is *lower* than the second portion of said dielectric); and forming a *trench* region in said *second portion* of said dielectric and a *via* region in said *doped*

region, which is also different from the instant invention (i.e. a trench region is formed in said *dense region* and a via region is formed in the *second portion* of the dielectric layer).

Therefore, the instant invention is deemed to be directed to a *nonobvious* improvement over the invention patented in U.S. Pat. No. 6,080,663. The improvement comprises forming the dense region which has a *lower* etching rate than that of the *second portion* of said dielectric; and forming the trench region *in the dense region* (i.e. by removing the dense region) and the via region in the second portion of the dielectric layer. With the aforementioned patentably distinct features, it would provide a simple and effective means for forming a dual damascene opening.

6. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hsien-Ming Lee whose telephone number is 703-305-7341. The examiner can normally be reached on M-F (9:00 ~ 5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone number for the organization where this application or proceeding is assigned is (703) 308-7382.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Hsien-Ming Lee
Examiner
Art Unit 2823



OCT. 15, 2003